



New Frontiers 4 Announcement of Opportunity (AO) Concept Study Report (CSR) Evaluation Plan

Cleared for Public Release
December 10, 2018



Approval Signatures

New Frontiers 4

New Frontiers 4
CSR Evaluation
Plan

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Signed copy on file



Introduction

- The New Frontiers Program is designed to accomplish focused planetary science investigations, using innovative and efficient management approaches. The Program's prime objective is to answer unique science questions in the exploration of the Solar System. In the process, it seeks to contain total mission cost and development time and improve performance through the use of validated new technology and through commitment to, and control of, design, development, and operations costs. Also, it seeks to enhance educational and public outreach activities as integral parts of space science investigations.
- The purpose of this evaluation plan is to define the ground rules, processes, organizations, and schedules to be used in evaluating the New Frontiers 4 Concept Study Reports (CSRs).
- Two Missions were selected for concept studies, which constitute each investigation's Concept and Technology Development Phase (Phase A) of the Formulation process as outlined in NPR 7120.5E, NASA Spaceflight Program and Project Requirements.



Evaluation Plan Overview

- The New Frontiers 4 Announcement of Opportunity (AO NNH16ZDA011O), under which the investigations to be evaluated were selected, was issued December 9, 2016.
- The Science Office for Mission Assessments (SOMA) at NASA Langley Research Center (LaRC) developed this New Frontiers 4 AO CSR Evaluation Plan for the Science Mission Directorate (SMD) at NASA Headquarters.
- This CSR Evaluation Plan has been cleared for public release by SMD.
- The Lead New Frontiers Program Scientist is responsible for validating all evaluation processes, responsibility assignments, assumptions, and ground rules.



New Frontiers Missions Selected for Concept Studies

New Frontiers 4
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- Two Missions were selected for Phase A Concept Studies.
 - **Comet Astrobiology Exploration Sample Return (CAESAR)** – Steven Squyres, PI, Cornell University, Ithica, NY - The CAESAR mission seeks to return a sample from 67P/Churyumov-Gerasimenko, a comet that was successfully explored by the European Space Agency's Rosetta spacecraft, to determine its origin and history.
 - **Dragonfly** – Elizabeth Turtle, PI, Johns Hopkins University Applied Physics Laboratory, Laurel, MD - Dragonfly is a drone-like rotorcraft that would explore the prebiotic chemistry and habitability of dozens of sites on Saturn's moon Titan, an ocean world in our solar system.



Handling of Proprietary Data

- All CSR related materials will be considered proprietary.
- Only those individuals with a need to know will be allowed to view CSR materials.
- Each non-Civil Servant (CS) or non-Intergovernmental Personnel Act (IPA) Assignee Evaluator will sign a NASA Non-Disclosure Agreement (NDA) which must be on file with NASA Research and Education Support Services (NRESS) prior to any CSRs being distributed to that evaluator.
 - CS and IPA Evaluators are not required to sign an NDA.
- All Report Materials will be numbered and controlled, with a record of who has what materials.
- Evaluators will be briefed at a Kickoff telecon on how to handle the CSR material. Evaluators will be briefed that they are not allowed to discuss CSRs with anyone outside the Evaluation Panels ever. Evaluators will be briefed to not contact anyone outside of their Evaluation Panel to gain insight on any CSR related matter without expressly getting authorization from the Lead New Frontiers Program Scientist (Dr. Curt Niebur), or the Technical, Management, and Cost (TMC) Panel Chair (Victor Lucas) in advance of making the contact.
- SPD-17 detailing Observers at Review Panels will be followed. Observers will not have access to CSR or evaluation materials.



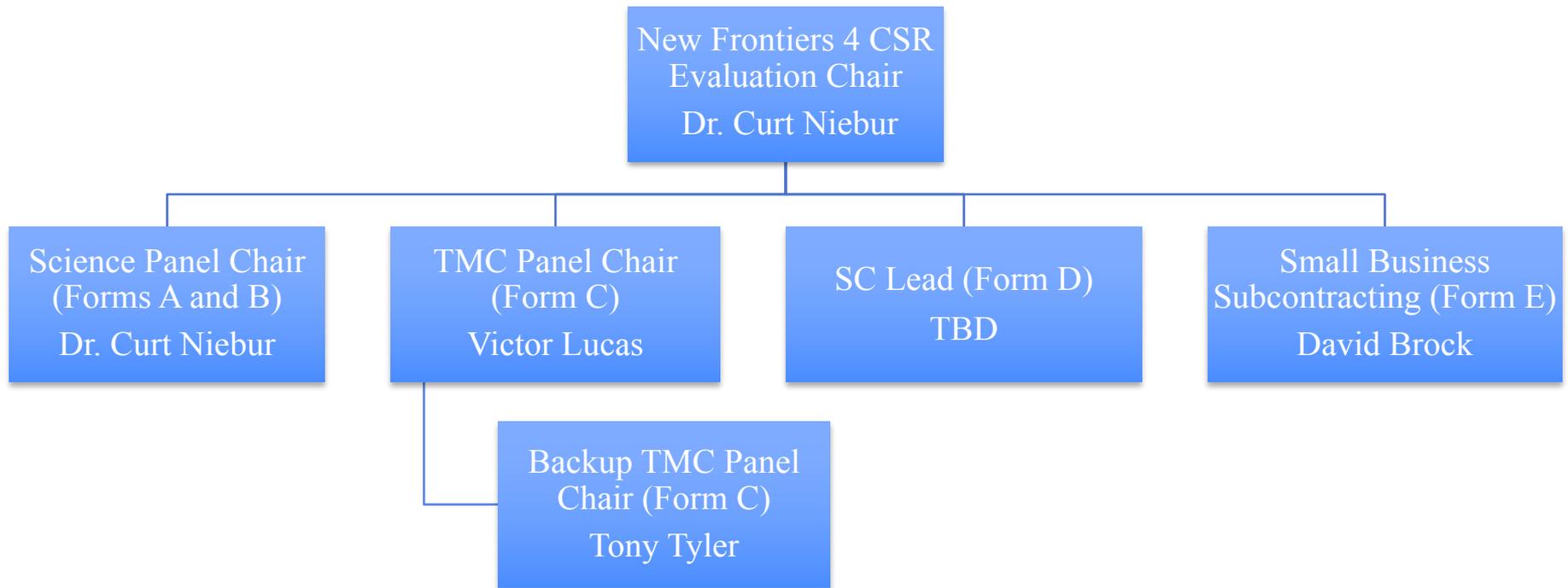
Handling of Proprietary Data (continued)

- During the Evaluation, all proprietary information that needs to be exchanged between evaluators will be transferred securely via the Remote Evaluation System (RES) website maintained by SOMA, via the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES), via the secure ScienceWorks system maintained by SMD, via controlled WebEx, via NASA's Large File Transfer (LFT) capability, or via encrypted email, parcel post, fax, or regular mail. Proprietary information will not be sent via unencrypted email.
- Telecon line information is confidential. The phone numbers and pass codes are posted in a file on the Remote Evaluation Site (RES) or distributed via NASA LFT. Participants will be briefed to ensure they do not provide this information to anyone or distribute this information via email.
- When the evaluation process is complete, CSR materials will be collected. Some copies (for archival purposes) will be maintained in the NRESS and SOMA vaults. Also, some CSR material from the down-selected mission(s) will be provided to the Planetary Missions Program Office at MSFC. All other CSR materials will be destroyed.
- Evaluators' electronic and paper evaluation materials will be deleted/destroyed when the evaluation process is complete.



Organization New Frontiers 4

New Frontiers 4 CSR Evaluation Plan





Plan to Avoid Conflicts of Interest (COIs)

- Members of Evaluation Panels are cross checked against the draft list of organizations and individuals provided by the study teams to ensure no individual or organizational COI exists with the planned evaluators. Evaluators are required to raise any potential COIs.
- After the Concept Study Reports (CSRs) are received, all members of the Evaluation Panels will be cross checked against the final lists of organizations and individuals on each CSR to ensure no individual or organizational COI exists on the list of evaluators.
- In addition, all evaluators will review the final lists of conflicted organizations and individuals and be required to divulge whether they have any financial, professional, or personal potential conflicts of interest and whether they work for a profit making company that directly competes with any profit making proposing organization.
- Any potential COI issue is discussed with the Lead New Frontiers Program Scientist and the SMD Deputy Associate Administrator for Research, and documented in the New Frontiers 4 Downselect COI Mitigation Plan.
- All Civil Service evaluators will self-certify their COI status by reviewing a combined listing of individuals and organizations associated with the CSRs. The TMC evaluators must notify the TMC Panel Chair, Victor Lucas, in case there is a potential conflict. The Science evaluators must notify the Science Panel Chair, Dr. Curt Niebur, in case of a potential conflict.
- If any evaluators with potential organizational COI must be used, their respective organizations must submit a plan, as required by their contract or SMD waiver, addressing the Conflict of Interest and mitigation plan. This plan will outline how they will firewall the potentially conflicted evaluator(s) during the evaluation process from the conflicted part of their organization.



- If during the evaluation there is any actual conflict of interest noted, the conflicted member(s) will be notified to stop reviewing CSRs immediately and the Lead New Frontiers Program Scientist will be notified. Steps will be expeditiously taken to remove any actual or potential bias imposed by the conflicted member(s).
- Community standards for conflicts of interest will be applied to all evaluators as directed in SMD Policy Document SPD-01A, *Handling Conflicts-of-Interest for Peer Reviews*. Standards for financial conflicts of interest as specified in 18 U.S.C. § 208 will be applied to civil servant evaluators. The HQ Office of General Counsel will be consulted as necessary.



Evaluation Criteria and Additional Selection Factors

- The Criteria to Evaluate the Concept Study Reports are documented in the New Frontiers 4 GUIDELINES AND CRITERIA FOR THE PHASE A CONCEPT STUDY at:
<https://newfrontiers.larc.nasa.gov/nfpl.html>
- Evaluation criteria for the Concept Study: approximate significance of each criterion is indicated by the percent weighting.
 - Criterion A: Scientific Merit of the Investigation (will not be re-evaluated unless it is determined that the science has changed from that described in the Step 1 proposal) (approximately 20%)
 - Criterion B: Scientific Implementation Merit and Feasibility of the Investigation (approximately 40%)
 - Criterion C: TMC Feasibility of Mission Implementation, Including Cost Risk (approximately 40%)
- Additional selection factors
 - Criteria D, and E: Quality of plans for optional Student Collaboration (SC) if proposed, and small business subcontracting plans. In addition, NASA budget changes and/or other programmatic factors, including but not limited to changes in scientific mandates, national priorities, and budgetary forecasts that were not evident when the New Frontiers 4 AO was issued. The PI-Managed Mission Cost, as well as other programmatic factors, may be additional selection factors.



Evaluation Criterion A

- **Scientific Merit of the Investigation** - The Lead New Frontiers Program Scientist will determine whether any issues that may have emerged in the course of the concept study have effected significant changes to the science objectives or other aspects of the proposed Baseline and Threshold Science Missions (see Requirement CS-17 in Section II of the New Frontiers 4 GUIDELINES AND CRITERIA FOR THE PHASE A CONCEPT STUDY) in such a manner as to have impacted the basis for the evaluation of the scientific merit of the investigation as determined by the peer review panel for the Step 1 proposal. If there are no significant changes to the proposed investigation that undermine the basis of this rating, the peer review panel rating for scientific merit of the Step 1 proposal will be the rating for scientific merit of the CSR. If there are significant changes, the Lead New Frontiers Program Scientist will convene a peer review panel to re-evaluate the scientific merit of the objectives in light of these changes. The factors for re-evaluating this criterion will be the same as those used for the Step 1 proposal review (Section 7.2.2 of the AO).



Evaluation Criterion B

- **Scientific Implementation Merit and Feasibility of the Investigation** - All of the factors defined in Section 7.2.3 of the AO also apply to the evaluation of the CSR. Note that details have been added to one of the subfactors of Factor B-1, Merit of the instruments and mission design. Also, an additional subfactor has been added to Factor B-2, Probability of technical success.
 - Factor B-1. Merit of the instruments and mission design for addressing the science goals and objectives. This factor includes the degree to which the proposed mission will address the goals and objectives; the appropriateness of the selected instruments and mission design for addressing the goals and objectives; the degree to which the proposed instruments and mission can provide the necessary data, *including details on data collection strategy and plans* (*n.b.*, items in italics added for the evaluation of the CSR); and the sufficiency of the data gathered to complete the scientific investigation.



Evaluation Criterion B (continued)

- **Factor B-2. Probability of technical success.** This factor includes the maturity and technical readiness of the instruments or demonstration of a clear path to achieve necessary maturity; the adequacy of the plan to develop the instruments within the proposed cost and schedule; the robustness of those plans, including recognition of risks and mitigation plans for retiring those risks; the likelihood of success in developing any new technology that represents an untested advance in the state of the art; the ability of the development team - both institutions and individuals - to successfully implement those plans; and the likelihood of success for both the development and the operation of the instruments within the mission design. *This factor includes assessment of technology readiness, heritage, environmental concerns, accommodation, and complexity of interfaces for the instrument design (n.b., subfactor in italics added for the evaluation of the CSR).*
- **Factor B-3. Merit of the data analysis, data availability, data archiving plan, and/or sample analysis plan.** This factor includes the merit of plans for data analysis and/or sample analysis, data archiving, and/or sample curation to meet the goals and objectives of the investigation; to result in the publication of science discoveries in the professional literature; and to preserve data and analysis samples of value to the science community. Considerations in this factor include assessment of planning and budget adequacy and evidence of plans for well-documented, high-level data products and software usable to the entire science community; assessment of adequate resources for physical interpretation of data; an assessment of the planning and budget adequacy and evidence of plans for the preliminary evaluation and curation of any returned samples; reporting scientific results in the professional literature (e.g., refereed journals); and assessment of the proposed plan for the timely release of the data to the public domain for enlarging its science impact.



Evaluation Criterion B (continued)

- Factor B-4. Science resiliency. This factor includes both developmental and operational resiliency. Developmental resiliency includes the approach to descoping the Baseline Science Mission to the Threshold Science Mission in the event that development problems force reductions in scope. Operational resiliency includes the ability to withstand adverse circumstances, the capability to degrade gracefully, and the potential to recover from anomalies in flight.
- Factor B-5. Probability of science team success. This factor will be evaluated by assessing the experience, expertise, and organizational structure of the science team and the mission design in light of any proposed instruments. The role of each Co-Investigator (Co-I) and collaborator will be evaluated for necessary contributions to the proposed investigation; the inclusion of Co-Is and/or collaborators who do not have a well defined and appropriate role may be cause for downgrading of the CSR evaluation.
- Factor A-3 of the AO will be re-evaluated as a factor for Scientific Implementation Merit and Feasibility; it has been renumbered as Factor B-6.
 - Factor B-6. Likelihood of scientific success. This factor includes how well the anticipated measurements support the goals and objectives; the adequacy of the anticipated data to complete the investigation and meet the goals and objectives; and the appropriateness of the mission requirements for guiding development and ensuring scientific success.



Evaluation Criterion B (continued)

- A new evaluation factor that is not described in the New Frontiers 4 AO, and therefore was not evaluated for Step 1 proposals, will also be included. This Factor B-7 below will be evaluated for the CSRs in addition to the factors specified in Section 7.2.3 and Section 7.2.2 of the New Frontiers 4 AO (repeated or updated above as Factors B-1 through B-6).
 - **Factor B-7. Maturity of proposed Level 1 science requirements and Level 2 project requirements.** This factor includes assessment of whether the Level 1 requirements are mature enough to guide the achievement the objectives of the Baseline Science Mission and the Threshold Science Mission, and whether the Level 2 requirements are consistent with the Level 1 requirements. The CSR will be evaluated for whether the requirements are stated in unambiguous, objective, quantifiable, and verifiable terms that do not conflict. The CSR will be evaluated for the adequacy, sufficiency, and completeness of the Level 1 and Level 2 requirements, including their utility for evaluating the capability of the instruments and other systems to achieve the mission objectives. The stability of the Level 1 science requirements and Level 2 project requirements will be assessed including whether the requirements are ready, upon initiation of Phase B, to be placed under configuration control with little or no expected modifications for the lifecycle of the mission.
- Except for any impact to the primary mission due to inclusion of TDO(s) and/or SEO(s), which will be included in the factors above, Scientific Implementation Merit and Feasibility of the of TDO(s) and SEO(s) will be evaluated using the criteria given in Section I on a separate form. The TDO/SEO evaluation will be provided to the selection official separate from the primary mission evaluation and will not be included in the determination of the primary mission science implementation merit.



Evaluation Criterion C

- **TMC Feasibility of the Mission Implementation, including Cost Risk** - All of the factors defined in Section 7.2.4 of the New Frontiers 4 AO apply to the evaluation of the CSR. All of these factors are interpreted as including an assessment as to whether technical, management, and cost feasibility are at least at a Phase A level of maturity.

Note that an additional subfactor has been added to Factor C-2, Adequacy and robustness of the mission design and plan for mission operations. Clarifications have been made to two subfactors and one subfactor added to Factor C-4, Adequacy and robustness of the management approach and schedule, including the capability of the management team. Also, the risk management aspects of Factor C-4 have been removed from Factor C-4 and included in a new evaluation factor, Factor C-6, Adequacy of the risk management plan.

- Factor C-1. Adequacy and robustness of the instrument implementation plan. The maturity and technical readiness of the instrument complement will be assessed, as will the ability of the instruments to meet mission requirements. This factor includes an assessment of the instrument design, accommodation, interface, heritage, and technology readiness. This factor includes an assessment of the instrument hardware and software designs, heritage, and margins. This factor includes an assessment of the proposer's understanding of the processes, products, and activities required to accomplish development and integration of the instrument complement. This factor also includes adequacy of the plans for instrument systems engineering and for dealing with environmental concerns. This factor includes an assessment of plans for the development and use of new instrument technology, plans for advanced engineering developments, and the adequacy of backup plans to mature systems within the proposed cost and schedule when technologies having a TRL less than 6 are proposed.



Evaluation Criterion C (continued)

- **Factor C-2. Adequacy and robustness of the mission design and plan for mission operations.** This factor includes an assessment of the overall mission design and mission architecture, the spacecraft design and design margins (including margins for launch mass, delta-V, and propellant), the concept for mission operations (including communication, navigation/tracking/trajectory analysis, and ground systems and facilities), and the plans for launch services. *This factor includes an assessment of the scientific measurements planning and decision making processes (including any priorities assigned to specific measurements and plans to update the measurement strategy based on early measurements), and the schedule and workforce allocated to these processes (n.b., subfactor in italics added for the evaluation of the CSR).* This factor includes mission resiliency – the flexibility to recover from problems during both development and operations – including the technical resource reserves and margins, system and subsystem redundancy, and reductions and other changes that can be implemented without impact to the Baseline Science Mission.



Evaluation Criterion C (continued)

- Factor C-3. Adequacy and robustness of the flight systems. This factor includes an assessment of the flight hardware and software designs, heritage, and margins. This factor includes an assessment of the proposer's understanding of the processes, products, and activities required to accomplish development and integration of all elements (flight systems, ground and data systems, *etc.*). This factor includes an assessment of the adequacy of the plans for spacecraft systems engineering, qualification, verification, mission assurance, launch operations, and entry/descent/landing. This factor includes the plans for the development and use of new technology, plans for advanced engineering developments, and the adequacy of backup plans to ensure success of the mission when technologies having a TRL less than 6 are proposed. The maturity and technical readiness of the spacecraft, subsystems, and operations systems will be assessed. The adequacy of the plan to mature systems within the proposed cost and schedule, the robustness of those plans, including recognition of risks and mitigation plans for retiring those risks, and the likelihood of success in developing any new technologies will be assessed. NASA-developed technologies offered in the AO will be included in this factor to the extent described in AO Table 4.



Evaluation Criterion C (continued)

- **Factor C-4. Adequacy and robustness of the management approach and schedule, including the capability of the management team.** This factor includes: the adequacy of the proposed organizational structure and WBS; the management approach including project level systems engineering; the roles, qualifications, and experience of the PI, PM, *Project Systems Engineer (PSE)* (*n.b.*, items in italics added for the evaluation of the CSR), other named Key Management Team members, and implementing organization, mission management team, and known partners; the commitment, spaceflight experience, and relevant performance of the PI, PM, *PSE* (*n.b.*, item in italics added for the evaluation of the CSR), other named Key Management Team members, and implementing organization, mission management team, and known partners against the needs of the investigation; the commitments of partners and contributors; and the team's understanding of the scope of work covering all elements of the mission, including contributions. This factor also includes assessment of elements such as the relationship of the work to the project schedule, the project element interdependencies, the associated schedule margins, and an assessment of the likelihood of launching by the proposed launch date. Also evaluated under this factor are the proposed project and schedule management tools to be used on the project, *along with the subcontracting plan including small and small disadvantaged businesses* (*n.b.*, subcontracting plan subfactor, in italics, added for the evaluation of the CSR).
 - If tailoring of program and project management requirements is proposed, evaluators will comment on the CSR team's justification for that tailoring, but will not consider it a part of the risk rating.



Evaluation Criterion C (continued)

- Factor C-5. Adequacy and robustness of the cost plan, including cost feasibility and cost risk. This factor includes elements such as cost, cost risk, cost realism, and cost completeness including assessment of the basis of estimate, the adequacy of the approach, the methods and rationale used to develop the estimated cost, the discussion of cost risks, the allocation of cost reserves by phase, and the team's understanding of the scope of work (covering all elements of the mission, including contributions). The adequacy of the cost reserves will be evaluated and understanding of the cost risks will be assessed. This factor also includes an assessment of the proposed cost relative to estimates generated using parametric models and analogies. Also evaluated under this factor are the proposed cost management tools to be used on the project.



Evaluation Criterion C (continued)

- The following evaluation factor has been removed as a subset of Factor C-4 described in the New Frontiers 4 AO and has been revised for the evaluation of the CSR.
 - Factor C-6. Adequacy of the risk management plan. The adequacy of the proposed risk management approach will be assessed, including any risk mitigation plans for new technologies, any long-lead items, and the adequacy and availability of any required manufacturing, test, or other facilities. The approach to any proposed descoping of mission capabilities will be assessed against the potential science impact to the proposed Baseline Science Mission. The plans for managing the risk of contributed critical goods and services will be assessed, including the plans for any international participation, the commitment of partners and contributors as documented in Letters of Commitment, and the technical adequacy of contingency plans, where they exist, for coping with the failure of a proposed cooperative arrangement or contribution; when no mitigation is possible, this should be explicitly acknowledged. The stability and reliability of proposed partners, and the appropriateness of any proposed contribution, is not assessed as a management risk but will be assessed by SMD as a programmatic risk element of the investigation.



Evaluation Criterion C (continued)

- The following are new evaluation factors that are not described in the New Frontiers 4 AO and were not evaluated for Step 1 proposals. These will be evaluated for the CSRs in addition to the factors given in Section 7.2.4 of the New Frontiers 4 AO and repeated or updated above as Factors C-1 through C-6.
 - **Factor C-7. Ground systems.** This factor includes an assessment of the proposed mission operations plans, facilities, hardware and software, processes, and procedures.
 - **Factor C-8. Approach and feasibility for completing Phase B.** The completeness of Phase B plans and the adequacy of the Phase B approach will be assessed. This assessment will include evaluation of the activities/products, the organizations responsible for those activities/products, and the schedule to accomplish the activities/products.
 - **Factor C-9. Implementation feasibility and risk of any proposed use of NASA-developed technology.** The proposed infusion of NASA-developed technology described in Section 5.9.3 of the AO will be assessed including whether the plan adequately interfaces with, integrates, and uses the NASA-developed technology.
- Except for any impact to the primary mission due to inclusion of TDO(s) and/or SEO(s), which will be included in the factors above, TMC feasibility of TDO(s) and SEO(s) will be evaluated using the same criteria as the primary mission on a separate form. The TDO/SEO evaluation will be provided to the selection official separate from the primary mission evaluation and will not be included in the determination of the primary mission risk.
- For the purposes of the CSR, investigation teams are not required to hold reserves against Government Furnished Equipment (GFE) such as a NASA-provided launch service. They should assume the Government will deliver as promised on factors such as Launch Vehicle performance and schedule. The Government is holding separate reserves on its promises.



Evaluation Criterion D

- **Overall Merit of Student Collaboration (SC), if proposed** - The following is a new evaluation factor that is not described in the New Frontiers 4 AO and therefore was not evaluated for Step 1 proposals. This factor will be evaluated for CSRs.
 - This factor will include an assessment of whether the scope of the SC follows the guidelines in Section 5.5.3 of the New Frontiers 4 AO. The criteria to be used to evaluate the SC component and a discussion of those criteria are described in the document *Explanatory Guide to the NASA Science Mission Directorate Educational Merit Evaluation Factors for Student Collaboration*, which can be found in the Program Libraries.
 - For missions proposed against the New Frontiers 4 AO, there is no minimum and no maximum allowable cost for a SC. However, NASA is providing a student collaboration incentive of \$10M FY2015 outside of the PI-Managed Mission Cost. If the SC costs more than the student collaboration incentive, then the rest of the cost of the SC must be provided via contribution(s) at no cost to NASA.



Evaluation Criterion E

- **Merit of the Small Business Subcontracting Plans** - The following is a new evaluation factor that is not described in the New Frontiers 4 AO and therefore was not evaluated for Step 1 proposals. This factor will be evaluated for CSRs.
 - This factor will be evaluated on the participation goals and quality and level of work performed by small business concerns overall, as well as that performed by the various categories of small business concerns listed in FAR 52.219-9, except for Small Disadvantaged Businesses (SDBs). Offerors will separately identify, and will be evaluated on, participation targets of SDBs in North American Industry Classification System (NAICS) codes determined by the Department of Commerce to be underrepresented industry sectors.



CSR Evaluation Panel Products

- Form A (if necessary) and Form B for all CSRs
 - Grade range: Excellent, Excellent/Very Good, Very Good, Very Good/Good, Good, Good/Fair, Fair, Fair/Poor, or Poor
 - The reported Grade reflects the median
- Form C for all CSRs
 - Risk rating range: Low Risk, Low/Medium Risk, Medium Risk, Medium/High Risk, or High Risk
 - The reported Risk Rating reflects the median grade
- Form D (Student Collaboration) if proposed
 - Student Collaboration separable from the main mission: Yes or No
 - Grades: Meritorious or Not Meritorious.
- Form E (Small Business Subcontracting Plans) for all CSRs
 - Grades: Acceptable, or Needs Work



Grade Definitions - Forms A and B

- Form A and B Grade Definitions
 - **Excellent:** A comprehensive, thorough, and compelling CSR of exceptional merit that fully responds to the objectives of the New Frontiers 4 AO as documented by numerous and/or significant strengths and having no major weaknesses.
 - **Very Good:** A fully competent CSR of very high merit that fully responds to the objectives of the New Frontiers 4 AO, whose strengths fully outbalance any weaknesses.
 - **Good:** A competent CSR that represents a credible response to the New Frontiers 4 AO, having neither significant strengths nor weakness and/or whose strengths and weaknesses essentially balance.
 - **Fair:** A CSR that provides a nominal response to the New Frontiers 4 AO, but whose weaknesses outweigh any perceived strengths.
 - **Poor:** A seriously flawed CSR having one or more major weaknesses (e.g., an inadequate or flawed plan of research, or lack of focus on the objectives of the New Frontiers 4 AO).
- Evaluators may also use grades in between these defined above



Definitions of Criterion B Findings

Major Strength: A facet of the response that is judged to be well above expectations and substantially contributes to the Science Implementation Merit and Feasibility of the Investigation.

Minor Strength: A strength that substantiates the Science Implementation Merit and Feasibility of the Investigation.

Major Weakness: A deficiency or set of deficiencies taken together that are judged to substantially detract from the Science Implementation Merit and Feasibility of the Investigation.

Minor Weakness: A weakness that detracts from the Science Implementation Merit and Feasibility of the Investigation.

Note: Unlike in Step 1, minor findings can influence risk ratings.



Science Feasibility Impact

- The Science Feasibility Impact of Criterion B Major Weaknesses will be considered.
 - Factors B-1 to B-6:
“This weakness is anticipated to have a {small, modest, serious} impact on the ability of the proposed mission to achieve {list specific objective(s)} of {total number of objectives} science objective(s).”
 - Factor B-7:
“This weakness is anticipated to have a {small, modest, serious} impact on the ability to measure progress of the proposed mission in achieving {list specific objective(s)} of {total number of objectives} science objective(s).”
- Goal is to be clear on the severity of a Criterion B Major Weakness.



Risk Ratings Definitions - Form C

The following definitions are indicators of risk. Evaluators must consider these definitions and input available for their consideration (e.g., cost model applicability, uncertainty of the cost models error bars and schedule analyses, uncertainty of the cost threats, mitigating factors such as major strengths, etc.) together with their judgement in determining the appropriate risk for a particular investigation.

Rating	Definition
Low Risk	Resources for technical, management, schedule, and cost are at or above the appropriate levels, with at least one resource significantly above, even after taking into account any problems that have been identified in the Phase A evaluation. No risks with unquantified cost threats* have been identified.
Low/Medium Risk	No problems have been identified in the Phase A evaluation that reduce the technical, management, schedule, and cost resources below the appropriate levels. Any identified risks with unquantified cost threats have a low probability of occurrence.
Medium Risk	Problems have been identified in the Phase A evaluation that reduce one of the resources slightly below the appropriate levels for: technical, management, schedule, or cost. Sound management and effective application of engineering resources will be required to solve the problems. Any identified risks with unquantified cost threats have a probability of occurrence that is not high.
Medium/High Risk	Problems have been identified in the Phase A evaluation that reduce one or more of the resources below the appropriate levels for: technical, management, schedule, and/or cost. The problems identified may not be solvable within the resources proposed, even with the use of sound management and effective application of engineering resources.
High Risk	Problems have been identified in the Phase A evaluation that reduce one or more of the resources significantly below the appropriate levels for: technical, management, schedule, and/or cost. The problems identified are deemed unsolvable within the resources proposed.

***Risks with unquantified cost threats** are defined in the grades above as those major weaknesses whose cost to fix cannot be quantified, but is large. The impacts of these risks are significant because they could lead to not achieving the baseline mission with the resources available.



Criterion C Panel Evaluation Principles for New Frontiers 4 AO Down-select

- Basic assumptions for Step 1:
 - Proposing team is the expert on their proposal.
 - Proposing team's task is to provide evidence that the project is Low Risk.
 - Criterion C Panel's task is to try to validate proposing team's assertion of Low Risk.
 - Proposing team given the benefit of the doubt.
- CSR Feasibility and Risk Assessment in Step 2:
 - Tasks are the same as for Step 1, but expectations are higher.
 - Study team's task is to provide evidence that the project is Low Risk.
 - Criterion C Panel's task is to try to validate study team's assertion of Low Risk.
 - The study team is not given the benefit of the doubt in the down-select.
- All CSRs will be reviewed to identical standards.
 - All CSRs shall receive same evaluation treatment in all areas.
- The Criterion C Panel is made up of evaluators who are subject matter experts in the areas of the CSRs that they evaluate.
- The Criterion C Panel develops findings for each CSR that are based on individual comments and reflect the general agreement of the entire panel.
 - Comments that are *as expected* are not included as findings. Comments that are *above expectations* result in strengths. Comments that are *below expectations* result in weaknesses.



Definitions of Criterion C Findings

Major Strength: A facet of the response that is judged to be well above expectations and can substantially contribute to the ability to meet technical commitments on schedule and within cost.

Major Weakness: A deficiency or set of deficiencies taken together that are judged to substantially affect the ability to meet the proposed technical objectives within the proposed cost and schedule.

Minor Strength: A strength that is substantial enough to be worthy of note and brought to the attention of study team in debriefings.

Minor Weakness: A weakness that is substantial enough to be worthy of note and brought to the attention of study team in debriefings.

Note: Unlike in Step 1, minor findings can influence risk ratings.



Cost Evaluation

- All information from the entire evaluation process will be considered in the final cost assessment.
- The proposed cost for Phases A-D will be assessed using estimates generated by three independent cost models.
- The proposed cost for Phase E of Full Missions will be assessed using estimates from at least one cost model.
- The evaluation will assess the cost risk, cost realism, and cost completeness, including the basis of estimate, the adequacy of the approach, the methods and rationale used to develop the estimated cost, the discussion of cost risks, the allocation of cost reserves by phase, and the team's understanding of the scope of work.
- The likelihood and cost impact of significant weaknesses and cost analysis findings will be assessed.
- Cost threat impacts to the proposed unencumbered reserves will be assessed (see Cost Threat Matrix slide 35).
- The adequacy of the remaining unencumbered reserves will be assessed.
- Draft Forms C and Cost Evaluation Summaries (CESs) will be completed on all CSRs prior to the Initial Form C Plenary.
- During the Form C Plenaries, the entire panel will participate in Cost deliberations
- All significant Cost Findings will be included on the Form C and considered in the TMC Risk Rating.



Cost Threat Matrix

- The *likelihood* and *cost impact*, if any, of each weakness is stated as “This finding represents a cost threat assessed to have a Unlikely / Possible / Likely / Very Likely / Almost Certain likelihood of a Very Minimal / Minimal / Limited / Moderate / Significant / Very Significant cost impact being realized during development and / or operations, which results in a reduction from the proposed unencumbered reserves.”
- The *likelihood* is the probability range that the *cost impact* will materialize.
- The *cost impact* is the current best estimate of the range of costs to mitigate the realized threat.
- The cost threat matrix below defines the adjectives used to describe the *likelihood* and *cost impact*.
- The *minimum* cost threat threshold is \$1M.

		Cost Impact (CI) % of PI-Managed Mission Cost to complete Phases A/B/C/D or % of Phase E not including unencumbered cost reserves or contributions					
Likelihood of Occurrence	Weakness	Very Minimal 0.25% < CI ≤ 2.5% (\$0M < CI ≤ \$0M) 1% < CI ≤ 2.5% (\$0M < CI ≤ \$0M)	Minimal 2.5% < CI ≤ 5% (\$0M < CI ≤ \$0M) 2.5% < CI ≤ 5% (\$0M < CI ≤ \$0M)	Limited 5% < CI ≤ 10% (\$0M < CI ≤ \$0M) 5% < CI ≤ 10% (\$0M < CI ≤ \$0M)	Moderate 10% < CI ≤ 15% (\$0M < CI ≤ \$0M) 10% < CI ≤ 15% (\$0M < CI ≤ \$0M)	Significant 15% < CI ≤ 20% (\$0M < CI ≤ \$0M) 15% < CI ≤ 20% (\$0M < CI ≤ \$0M)	Very Significant CI > 20% (CI > \$0M) CI > 20% (CI > \$0M)
Likelihood (L, %)	Almost Certain (L > 80%)						
	Very Likely (60% < L ≤ 80%)						
	Likely (40% < L ≤ 60%)						
	Possible (20% < L ≤ 40%)						
	Unlikely (L ≤ 20%)						

Note: Each instance of “\$0M” in the table above is converted to dollars according to the associated percentage, on a CSR-by-CSR basis. Depending on proposed PI-Managed Mission Cost, some columns may not apply.



Grade Definitions – Form D

Student Collaboration (SC)

- The merit of any Student Collaboration (SC) will be given one of two adjectives: Meritorious or Not Meritorious
 - **Meritorious:** The student collaboration proposed has achievable education goals and objectives and an implementation/oversight/management approach that will provide students with a rich hands-on education experience.
 - **Not Meritorious:** The student collaboration proposed has not articulated achievable education goals and objectives and/or the implementation/oversight/management approach limits the likelihood of success for student's opportunities for hands-on experience.



Grade Definitions – Form E

Small Business Subcontracting

- The merit of the Small Business Subcontracting Plans will be rated as either Acceptable or Needs Work
 - **Acceptable:** The subcontracting plan adequately addresses all required elements of a subcontracting plan, and the proposed subcontracting percentage goals and the quality level of the work to be performed by small business concerns is sufficient.
 - **Needs Work:** The subcontracting plan does not address all required elements of a subcontracting plan, or the proposed subcontracting percentage goals and quality of work to be performed by small businesses is not sufficient, and further participation must be negotiated if this mission is selected.



Criteria B & C Panel Evaluation Processes

- Evaluation panel members review assigned CSRs and perform an individual review before discussing findings with other members of the panel.
- The SOMA Remote Evaluation System will be used for:
 - Entering individual evaluation panel member's comments for Criterion C.
 - Developing draft and final Forms C for each CSR.
 - A repository for all final Forms for the evaluation (Forms B, C, D, and E).
- Only Evaluators who have participated in the Form C Initial Plenary, the Site Visits, and the Form C Final Plenary, may participate in polling on Form C.
 - Participation is defined as in person or via telecon.
 - Specialist Evaluators* may or may not be polled.
 - Form B form leads may participate in Form C polling.
- NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES) will be used for:
 - Entering individual evaluation panel member's comments for Criterion B.
 - Developing draft and final Forms B for each CSR.
- Evaluation and polling on Form B will be restricted to Form B Evaluators, with the exception of Form C instrument experts if designated by the Lead New Frontiers Program Scientist as Form B Evaluators.
- Only Evaluators who have participated in the Form B Initial Plenary, the Site Visits, and the Form B Final Plenary may participate in polling on Form B.
 - Participation is defined as in person or via telecon.

* Specialist Evaluators (to provide special technical expertise to Criterion B/C/D/E Panels) and External/Mail-In Evaluators (to provide special science expertise to the Criterion B Panel) may be utilized, respectively, based on the specific technology and science that is proposed.



- Consistency Review for Form C findings and Form B findings.
 - Form C consistency
 - A Form C Consistency Group will review all Form Cs and questions at the Initial Plenary, and all Form Cs at the Final Plenary.
 - Form C Evaluators will review all CSRs. Specialist Evaluators may review a subset of CSRs.
 - Form B consistency
 - Form B Consistency Checker(s) will review all Form Bs and questions at the Initial Plenary, and all Form Bs at the Final Plenary.
 - Form B and Form C consistency
 - At least one Form B Evaluator for each CSR will participate in the Form C discussions for each mission at the plenary meetings
 - Some Form C instrument experts will participate in Form B discussions.
 - Consistency of findings between Forms B and C will be reviewed and adjudicated at the Initial and Final Plenaries.



Initial Plenary

- The Initial Plenary is used to identify significant issues related to Criterion B and C based on the initial evaluation of the CSR. Initial Form Bs and Cs are reviewed.
- The Goal of the Initial Plenary is:
 1. Identify the Major Weaknesses, Minor Weaknesses, Major Strengths and Minor Strengths of each CSR.
 2. If necessary, develop questions and/or requests for information in addition to the Significant Weaknesses to give each study team an opportunity to clarify any misunderstanding.
- The main topic areas are the implementation issues in Criterion B and Criterion C.
- No polling on grades occurs at the Initial Plenary (Criterion B and Criterion C)
- The Significant Weaknesses (SWs), Questions, and Requests for Information will be sent to each study team 8 days prior to its Site Visit.
- Criterion D (Student Collaboration) and Criterion E (Small Business Subcontracting) are reviewed as required by Criterion specific panels prior to the Initial Plenary. Site Visit questions are prepared and provided no later than the Initial Plenary to the Lead New Frontiers Program Scientist.



Significant Weaknesses, Questions, and RFIs (SWQRs)

- Significant Weaknesses (SWs), Questions, and Requests for Information (RFIs) for the Study Team
 - All SWQRs developed at the Initial Plenary will be sent to each Study Team in advance of its Site Visit.
 - The SWs are preliminary and may change based on Site Visit information and further discussion by Evaluation Panels.
 - Questions may also be sent to the study team or verbalized during the Site Visit.
 - Questions must be of significance to a Form A, B, C, D, or E rating.
- The Lead New Frontiers Program Scientist will approve all SWQRs developed at the Initial Plenary. Three types of responses are planned for SWQRs. These types may be combined for a given SW, Question, or RFI.
 - Written response prior to Site Visit: SWQRs provided to the Study team that must be addressed in writing prior to the Site Visit. The nature of some SWQRs require data that must be reviewed prior to the Site Visit.
 - Written response at Site Visit: SWQRs that require documentation, but not extensive review.
 - Site Visit presentation: SWQRs that must be addressed the day of the Site Visit by way of presentation.
- Evaluation Team members may ask questions during the Site Visit to ensure they understand the response to a SWQR, or to clarify any significant issues.



Site Visits

- Site Visits with Oral Briefings will be used to clarify implementation details and commitments. The Study Team may address weaknesses identified in the Concept Study, and provide updates on the Concept Study developed after submission of the Concept Study Report.
- Site Visit locations and dates are negotiated with the PI
- Briefings at each Site Visit will be limited to 7 hours with 1 additional hour for a site tour, 15 additional minutes for SC if necessary, 1 hour for lunch, and 15 minute breaks in the morning and afternoon. Suggested schedule with SC of 8:00 a.m. – 5:45 p.m. (6:00 p.m., if SC is submitted).
- All Site Visit presentations/briefings should be in a plenary session with all Evaluation Team members attending – no splinter sessions – unless authorized by the Lead New Frontiers Program Scientist or TMC Panel Chair.
- Written Significant Weaknesses, Questions, and Requests for Information will be submitted to the PI 8 days before the Site Visit. All teams will have the same lead time.
- All information relevant to the evaluation, including information presented during the Site Visit; information provided in response to Significant Weaknesses, Questions, and/or Requests for Information; and information contained in the CSR will be considered during the evaluation.
- Additional Significant Weaknesses, Questions, and/or Requests for Information:
 - NASA may send additional Significant Weaknesses, questions, and/or requests for information to study teams the day after their respective Site Visits and/or during a specific timeframe (April 15-19, 2019), if necessary, to resolve any issue or clear up potential misunderstandings. Responses will typically be due within 4 days for post-Site Visit SWQRs and 24 hours for the April SWQRs.



Final Plenary Products

- Finalize all evaluation Forms based on the information in the CSRs and clarifications.
- Both Major and Minor, Strengths and Weakness will be considered in the Grade for all Forms.
 - Form B
 - Polling will be held at least twice on the Form B grade. The final polling is recorded. For the final polling, the individual grades are recorded and the median grade is calculated and recorded as the final polling. A median score that falls between two grades will be “rounded” in the direction of the mean score; if mean and median are equal, the score will be “rounded” towards the less favorable grade.
 - If there is a divergence of opinion, there may be additional rounds of discussion and polling.
 - SWs, questions, and/or requests for information generated during the Final Plenary may result in an additional rounds at or after the Final Plenary.
 - Form C
 - Form C will be reviewed three times. Polling will be held twice on the Form C risk rating. The final polling is recorded and reported. For the final polling, the individual grades are recorded, the median calculated and the final grade recorded which reflects the Form C Risk rating of the median of the polling. A median score that falls between two risk ratings will be “rounded” to the higher risk rating.
 - If there is a divergence of opinion, there may be additional rounds of discussion and polling.
 - SWs, questions, and/or requests for information generated during the Final Plenary may result in an additional rounds at or after the Final Plenary.
 - Form D, Student Collaboration (if necessary)
 - Representatives from the SC Panel will consider the Merit of any proposed Student Collaboration.
 - Form E, Small Business Subcontracting
 - MSFC Procurement personnel will evaluate this criterion



Observers and Transition Briefing

- The SMD Deputy Associate Administrator for Research may invite Civil Servants, Intergovernmental Personnel Act Assignees, and Contractors with downstream implementation responsibilities to participate as observers to panel meetings and Site Visits.
 - Observers must comply with SMD Policy Document SPD-17, *Statement of Policy on Observers at Panel Reviews of Proposals*. Per this policy Observers must not participate in formal or informal discussions with evaluators. This policy will be provided to all approved observers.
- After down-selection is announced, a Transition Briefing will be provided by a subset of the Evaluation Team to Civil Servants and Intergovernmental Personnel Act Assignees in the Planetary Missions Program Office and at NASA Headquarters who have implementation responsibilities.